

Mit den beiden Methoden, deren Leistungsfähigkeit bekannt war, ist kein Piezoeffekt nachweisbar. Die Versuche von HETTICH und STEINMETZ¹ und MASON und OWSTON² geben dasselbe Ergebnis. Dagegen haben sich die Resultate von ROSSMANN³ nicht bestätigt, wiewohl der von ihm behaupteten Existenz von elektrischen Zwillingen Aufmerksamkeit geschenkt worden war und teils seine eigene Versuchsführung⁴ reproduziert wurde. Aus ROSSMANN'S zahlenmässiger Angabe für den Piezomodul (Effekt 10mal grösser als Turmalin in der Methode von BERGMANN) würde sich eine elektromechanische Kopplung vom unwahrscheinlich hohen Wert 0,1 ergeben. Aus diesem Ergebnis darf noch nicht ohne weiteres gefolgert werden, dass Eis eine nichtpolare Struktur hätte, indem nämlich eine äusserst kleine Kopplung auf Grund der sehr lockeren Struktur des Eises möglich ist.

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Summary

Piezoelectricity of ice was investigated by two methods whose sensitivity was determined separately. No effect has been found. An electromechanical coupling of 10^{-3} or a corresponding piezoelectric modulus of 1.5×10^{-9} (stat. clbs. dyn⁻¹) would have been the lower limit for detecting piezoelectricity. Special attention was given to the selection of homogeneous crystals for these tests.

¹ A. HETTICH und H. STEINMETZ, Z. Phys. 76, 700 (1932).

² B. J. MASON und P. G. OWSTON, Phil. Mag. 43, 1911 (1952).

³ F. ROSSMANN, Exper. 6, 182 (1950).

⁴ Mitteilung von F. ROSSMANN und F. JONA, Phys. Inst. ETH., Zürich (April 1952).

Chemical Components of Plant Cuticle, with Special Reference to the Triterpenoid Constituents

There has been no report on the chemical components of plant cuticle since the work of LEE and PRIESTLEY¹ and of LEGG and WHEELER². Further, the true character of cutin has scarcely been studied. We have examined microchemically the leaves of some 600 kinds of Japanese plants and reached the conclusion that nearly 300 contain triterpenoids such as ursolic acid, etc.

The microchemical procedure is as follows: *Procedure I.* A drop of acetic anhydride is placed on a plant leaf, which is heated from below by a small flame for few seconds until the substance contained in the cuticle of a leaf has dissolved in the liquid. It is then sucked into a capillary tube of ca. 1 mm diameter. To this is added a very small quantity of conc. sulphuric acid, to which the red coloration of LIEBERMANN'S reaction occurs if some triterpenoids exist in the leaf.

Procedure II. Add a crystal of trichloro-acetic acid to the microsublimite of plant leaf in a small test tube, and heat up to 110°C, a violet or red colour occurs in general, while in the case of phytosterols, cholesterol or related substances the discoloration begins between room temperature and 60°C. By this means, the triterpenoid substances detected by the procedure I. can be proved to be triterpenoids.

¹ B. LEE and J. PRIESTLEY, Anal. Bot. 38, 525 (1924); 39, 755 (1925).

² V. LEGG and R. WHEELER, J. Chem. Soc. 1929, 2444.

Amongst the plants examined, the following families were found to have a high content of triterpenoids: *Caprifoliaceae, Scrophulariaceae, Apocynaceae, Gentianaceae, Oleaceae, Pitoraceae, Ericaceae, Araliaceae, Cornaceae, Myrtaceae, Eleagnaceae, Thymelaeaceae, Theaceae, Ulmae, Aquifoliaceae, Rosaceae, Trochodendraceae, Betulaceae, Myricaceae.* We also found that melissyl alcohol is widely distributed, accompanying the triterpenoids. Since the cuticle of the leaves of *Ilex latifolia* R. Br. was the thickest among the hundreds of plants examined, these leaves were boiled with 60% zinc chloride solution acidified with hydrochloric acid and washed with water. Finally, the cuticle was peeled off. We obtained the following analytical data of the cuticle:

Part soluble in methanol and carbon tetrachloride	29.0 %
Part saponifiable by 5% methanolic caustic potash	24.6 %
Cellulose, uronides, lignin, etc.	60.4 %
Ash	6.0 %
Total	100 %

The results of analysis in detail are:

Ursolic acid	0.68 %
Melissyl alcohol	0.32 %
Lignin ¹	38.0 %
Cellulose	10.2 %
Resene	10.2 %
Fatty acid	12.0 %
Polymer of fatty acid ²	11.0 %
Uronide ³	2.0 %
Glycerol ⁴	trace

The similarity of the results to those obtained with the cork of *Quercus Suber*⁵ is noteworthy.

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Zusammenfassung

Die Tatsache, dass Triterpenoid ein allgemeiner und wichtiger Bestandteil der pflanzlichen Kutikula sein muss, wurde nachgewiesen.

¹ Only 1.5% of methoxy group could be estimated.

² On acidifying the saponified liquid, there separated at once a solid, insoluble in any solvent, which became a black hard mass upon drying.

³ Estimated by LEFÈVRE'S method. In addition glucose and the derived glucosazone were found to exist by paper chromatography, using the solvent, Collidine: Phenol: Acetic acid: Water = 4:2:3:1.

⁴ Detected by the method of F. FEIGL: « Qualitative Analyse mit Hilfe von Tüpfelreaktion ».

⁵ H. E. FIERZ-DAVID, Exper. 1, 160 (1945). – DRAKE, J. Amer. Chem. Soc. 57, 1570 (1935).

Swollen Starch Grains and Osmotic Cells

Surveying the status of starch chemistry, MEYER¹ simply states that "the swollen starch grains behave like little osmotic cells which shrink in a hypertonic

¹ K. H. MEYER and G. C. GIBBONS, Adv. Enzymol. 12, 341 (1951). – K. H. MEYER, Exper. 8, 405 (1952).